

ISS-MPLM-PLAN-008

[BASELINE]

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MSFC

Safety & Mission Assurance

Program Plan

for

International Space Station

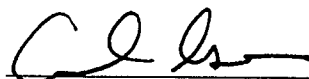
Multi-Purpose Logistics

Module (MPLM)

Sustaining Engineering

APPROVAL SHEET

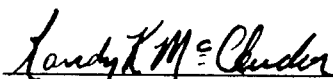
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DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Canceled)	Document Revision	Effective Date	Description

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ACRONYMS

The following acronyms apply:

DR1/2	Design Review 1 or 2
CEI	Cargo Element Integration
CIL	Critical Items List
FCA	Functional Configuration Audit
FMEA	Failure Modes and Effects Analysis
FRR	Flight Readiness Review
ISS	International Space Station
JSC	Johnson Space Center
LLIL	Limited Life Items List
LOD	Letter of Delegation
MRR	Mission Readiness Review
MSFC	Marshall Space Flight Center
NPG	NASA Procedures and Guidelines
PCA	Physical Configuration Audit
PDR	Preliminary Design Review
PMA	Pressurized Mating Adapter
PRACA	Problem Reporting and Corrective Action
QA	Quality Assurance
R&M	Reliability and Maintainability
RID	Review Item Discrepancy
S&MA	Safety and Mission Assurance
SMAPP	Safety and Mission Assurance Program Plan
SMART	Safety and Mission Assurance Review Team
SRR	Software Requirements Review
SSPP	System Safety Program Plan
TIM	Technical Interchange Meeting

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1.0 GENERAL

1.1 Introduction

The MPLM is a pressurized carrier, developed by Alenia Spazio under contract to the European Space Agency, that supports ISS logistics by providing capability for cargo supply and return, internal to a pressurized module. The MPLM is composed of a cylindrical shell terminated on one side by a forward cone that includes a hatch and berthing mechanism to allow on-orbit transfer of cargo, and on the other side, by a large access door for cargo installation and removal on the ground. The MPLM is launched in the Shuttle Payload Bay in either an active or passive configuration. These configurations refer to whether or not utilities are provided to the payloads manifested on the MPLM. Power and commanding is available to MPLM Systems in the payload bay for provision of shell heaters to prevent condensation in the module and operation of internal fans to assure proper mixing of the MPLM atmosphere.

The racks and RSP stowage bags are transferred between the MPLM and the ISS. The Boeing Prime Hazard Analysis will address the hazards that could occur during rack and stowage transfer. The MPLM is detached from the ISS and secured in the Orbiter PLB. The hazards that are associated with the MPLM transfer to and from the ISS are addressed by the Boeing Prime Hazard Analysis. The Orbiter undocks, de-orbits, and lands.

This document presents the Marshall Space Flight Center (MSFC) Safety and Mission Assurance (S&MA) Program Plan (SMAPP) for the Sustaining Engineering portion of the MPLM Program.

1.2 Objectives

S&MA will, through oversight, ensure that appropriate risk management, quality assurance, reliability, maintainability, and system safety activities are implemented during the Sustaining Engineering portion of the MPLM Program per the statement of work as defined in this document.

The MSFC S&MA activity is to ensure compliance with the:

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- MPLM Project Plan, MSFC-PLAN-3064

1.3 Customer Definition and Advocacy

The customers are the MSFC MPLM Project Manager, Associate Administrators for Codes Q and M, and the International Space Station program. This plan will identify the planning and implementation necessary to satisfy program requirements defined by these customers.

1.4 Agreement

The responsibility for determining how the program will be implemented and the accountability for meeting program milestones resides with the MSFC Project Manager.

MSFC is the lead NASA Center, responsible for cost, schedule, and technical performance for the development of the MPLM end items. JSC is responsible for integration of MPLM into the ISS.

1.5 MSFC S&MA Authority

The MSFC S&MA Office is responsible for all safety and mission assurance activities for the MPLM Project Office, FD23.

MSFC S&MA has the necessary authority to act upon or perform the following:

- Plan and oversee NASA S&MA involvement in the MPLM Project Sustaining Engineering.
- Monitor programmatic risk, mishaps and malfunctions.
- Review and make recommendations to the MSFC MPLM Project Office regarding safety requirements, quality, reliability, risk management, waivers, and deviations.
- Analyze system design changes and monitor program test activities as necessary to verify these changes.

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2.0 APPLICABLE DOCUMENTS

Documents identified below may be used in implementing this plan.

- NPG 7120.5A - NASA Program and Project Management Processes and Requirements
- MPLM Project Plan, MSFC-PLAN-3064
- MSFC Quality Manual *

* These documents are not included in the contract, however MSFC S&MA may use them for guidance.

3.0 ORGANIZATION AND RESPONSIBILITIES

The overall management of the MPLM Project is the responsibility of MSFC. Additional project responsibilities are divided among the MPLM contractor, Alenia Spazio, the European Space Agency (ESA), the Johnson Space Center and the International Space Station Integrator, Boeing. The MSFC S&MA Director is responsible for the development and implementation of this plan.

3.1 S&MA Responsibilities

The S&MA Lead for the MPLM Project is responsible for the overall S&MA effort at MSFC, reporting directly to the MSFC S&MA Director and coordinating with the MSFC MPLM Project Manager. The S&MA Lead has direct access to all MPLM Project design and development information and staff. The MPLM S&MA Team will have access to any area necessary to assure safety and mission success. Management interfaces are shown in Figure 1. Solid lines represent direct reporting and dashed lines show lines of communication and coordination.

In addition, S&MA will assure life-cycle implementation of demonstrated, stable, capable, and controlled S&MA processes and that all members of the program team are aware of the S&MA goals and responsibilities. This will be accomplished through effective communication between the S&MA Lead and the other members of the program team.

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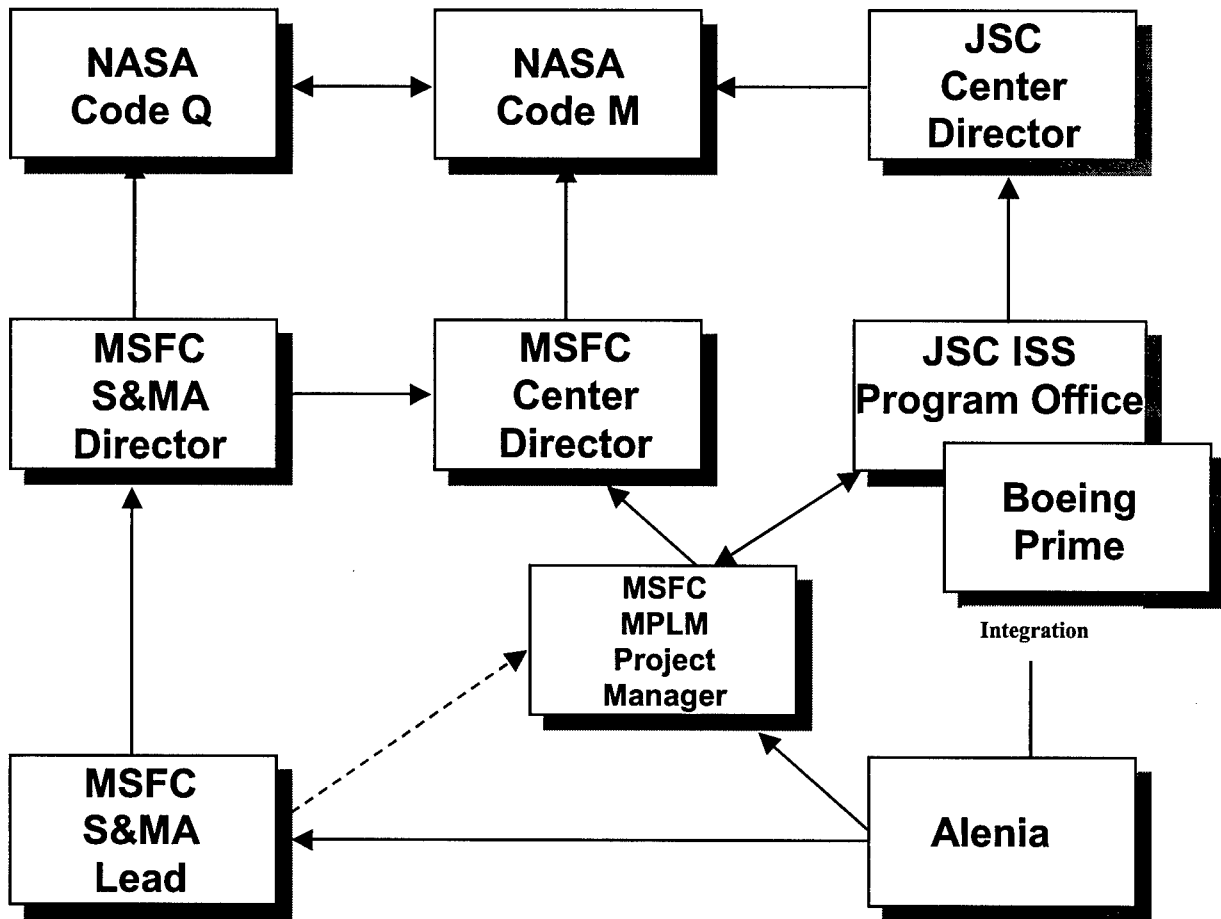


Figure 1: MSFC S&MA Management Interface

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4.0 IMPLEMENTATION APPROACH

This section defines the primary MSFC S&MA tasks associated with the Sustaining Engineering effort for the MPLM. Additionally, where S&MA activities and responsibilities reside with organizations external to MSFC, such responsibilities are identified along with the responsible organizations.

4.1 Quality Assurance

4.1.1 Objectives

Quality Assurance (QA) will provide guidance and define the requirements for oversight and assessment of the MPLM Project QA program implementation. MSFC QA oversight will provide accurate assessments of the quality assurance aspects of Alenia MPLM design, manufacturing, test, integration, processing and launch activities. The ultimate objective is to attain mission success by ensuring that MPLM meet the specified requirements.

4.1.1.1 Tasks

As a minimum, the following tasks will be performed:

- Participate in technical interchange meetings (TIM), project team meetings, and Milestone Reviews (SRR, PDR, CDR, DCR, AR, FRR, etc.).
- Review and evaluate proposed changes to MSFC baselined project documentation.
- Review and evaluate failure and discrepancy reports, analysis, and dispositions.
- Review and evaluate verification data associated with engineering changes.
- Develop and coordinate government agency representation and provide oversight of activities.
- Provide input to project metrics activities.
- Perform inspections (if in-house hardware)
- Support SQA (if in-house hardware)
- Support audits and Acceptance Reviews

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4.1.1.2 Deliverables

The following deliverables will be produced from the above tasks:

- TIM and team meeting reports including actions, decisions, and status.
- Assessment report of proposed documentation revisions and recommendation for approval or disapproval.
- Assessment report of failure and discrepancy reports including recommendation for approval or disapproval.
- Assessment report of verification data review conclusions and recommendations for approval or disapproval.
- QA metrics data.

4.2 Reliability and Maintainability

4.2.1 Objectives

Reliability requirements during the sustaining engineering phase of the MPLM project are limited to evaluation of changes, including impact on existing reliability analyses, processing of ALERTS and support to processing of Problem Reports generated during module processing flows. ALERTs for the MPLM are the responsibility of Johnson Space Center, the European Space Agency and the MPLM contractor, Alenia Spazio. Alenia will address the European ALERTs equivalent and respond to GIDEP ALERTs (or Suspect Condition Action Notices) forwarded by JSC. MSFC has no role or responsibility for ALERTs processing for the MPLM.

4.2.1.1 Tasks

As a minimum, the following tasks will be performed:

- Participate in TIMs, project team meetings, and Milestone Reviews (SRR, PDR, CDR, etc).
- Review and evaluate proposed changes for R&M impact to flight hardware and MSFC baselined project documentation.
- Review and evaluate failure reports, analyses, and dispositions for impact related to R&M. Support MPLM Project in closure of Problem Reports.
- Review and assess R&M testing results for compliance with requirements (as required by hardware modifications, if any)
- Provide input to project R&M metrics.

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- Support Reliability Review Board for ISS Flight Element Hardware
- Perform PRAs (if deemed necessary by Project Office, if not in-house then contractor may perform)

4.2.1.2 Deliverables

The following deliverables will be produced from the above tasks:

- R&M actions, decisions, and status resulting from TIMs and team meetings.
- Assessment of proposed documentation revisions and recommendations for approval or disapproval.
- Assessment of failure and discrepancy reports including recommendation for approval or disapproval based on impact to R&M. Problem Report closure data related to the MPLM FMEA (FMEA Worksheet Number and Failure Mode Criticality).

4.3 System Safety

4.3.1 Objective

The System Safety function during the sustaining engineering phase of the MPLM project will include documentation of changes to integrated Hazard Analyses, as defined in the agreement with JSC Safety Review Panels, based on design changes to the MPLM or changes in the MPLM cargo manifest.

4.3.1.1 Tasks

As a minimum, the following tasks will be performed:

- Participate in TIMs and project team meetings.
- Support Product Development Team to assure safety requirements understood and incorporated in design.
- Support Milestone Reviews (SRR, PDR, CDR, SRP, PAR, etc) and delta safety reviews (Flight and Ground, as appropriate) to document updates to safety analyses due to project changes.
- Develop Safety Data Package/Hazard Analysis for In-house hardware (review SCDP/HA if not in-house hardware).

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- Support Safety Review Panels MSFC, JSC, KSC or Range as applicable.
- Support Software Safety for project (Space Station elements only).
- Evaluate project design changes for safety impacts.
- Review Safety/Specification Verification Plans/procedure/closures.
- Launch Mission Support as required.

4.3.1.2 Deliverables

The following deliverables will be produced from the above tasks:

- Deltas to Integrated (GFE and non-GFE) MPLM Flight Hazards Analyses
- Deltas to Integrated (GFE and non-GFE) MPLM Ground Hazards Analyses
- Results from TIMs and other team meeting relative to issues, comments and recommendations related to safety.
- Assessment of the Alenia provided updates to hazard analyses and safety data packages.
- Assessment of the engineering change requests.

4.4 Risk Management

The MPLM Project Risk Management system is the responsibility of the MSFC MPLM Project Manager. The risk management system will comply with NPG 7120.5A requirements.

4.4.1 Objective

S&MA will review the risk management process to ensure compliance with specified requirements and assess risk mitigation.

4.4.1.1 Tasks

As a minimum the following tasks will be performed:

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- Identify Safety and Mission Assurance risks as defined in the Project Plan
- Ensure safety critical issues are assessed and closed.

4.4.1.2 Deliverables

- S&MA Risk data
- Closure data for identified S&MA risks

5.0 SCHEDULE AND MILESTONES

Refer to the MSFC MPLM Project Milestone Schedule for program and S&MA milestones.

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IV. EXPORT AND DISTRIBUTION RESTRICTIONS

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V. ORIGINATING ORGANIZATION APPROVAL

41. NAME: Randy McClendon	42. SIGNATURE: <i>Randy McClendon</i>	43. ORG. CODE: FD23	44. PHONE NUMBER: 544-3559	45. DATE: 5/3/01
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VI. TO BE COMPLETED BY MSFC DOCUMENTATION REPOSITORY

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